INTERNATIONAL TRANSPORT OF AIR POLLUTION

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While domestic sources of emissions are the primary cause of most air pollution in our country, the U.S. is both a source of pollution and a receiver of pollution from other countries. Air pollution flows across boundaries—not only between the U.S. and our closest neighbors, Canada and Mexico, but also between North America, Europe, and Asia, and to some extent, between North America, Africa, and Central and South America. International flow of air pollutants into the U.S. contributes to observed concentrations of ozone and particle pollution and deposition of mercury, persistent organic pollutants (POPs), and acid deposition.

TRANSPORT OF AIR POLLUTION AFFECTS THE U.S.

The impact that international transport of air pollution has on our ability to attain air quality standards or other environmental objectives in the U.S. has yet to be characterized (except in areas that are downwind of cities or sources in Mexico or Canada). Figure 34 illustrates major intercontinental transport pathways. Estimates based on the available evidence are highly uncertain, but suggest that the current contributions of international transport to observed concentrations, acid deposition and deposition of mercury are small. Increased emissions of particle pollution, mercury, and ozone precursors in developing countries associated with economic growth may increase background levels of these pollutants in the U.S.

For ozone and particle pollution, increased background levels of these pollutants could potentially make it more difficult for local and regional areas to achieve the National Ambient Air Quality Standards and long-term visibility improvement goals. Transported ozone and particle pollution also contribute to radiative forcing and global and regional climate change. For mercury and POPs, international flows contribute to deposition, and eventual human and ecosystem chemical exposures. In some locations, especially in Alaska, international sources are the dominant source of contamination for these toxic air pollutants.

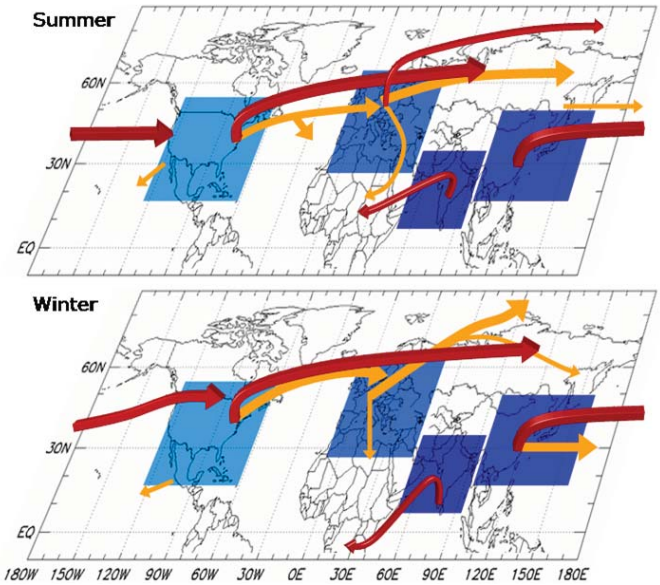


Figure 34. Major intercontinental transport pathways of CO emissions in the Northern Hemisphere. The colored boxes indicate the four source and receptor regions used in the Task Force on Hemispheric Transport of Air Pollution's (HTAP) on-going model intercomparison study. The arrows approximate the magnitude of main transport pathways in summer (June, July, August) and winter (December, January, February), based on modelled average CO transport over 8–10 day periods. Light arrows indicate transport generally near ground level (less than 3 km above the surface) and dark arrows indicate transport higher in the atmosphere (more than 3 km above the surface).
(Source: Figure E-1, HTAP 2007. Adapted from Figure 2 of Stohl and Eckhardt [2004], with kind permission of Springer Science and Business Media)

International Efforts to Address Air Pollution Transport

EPA is involved in a number of international efforts to address air pollution transport, including:

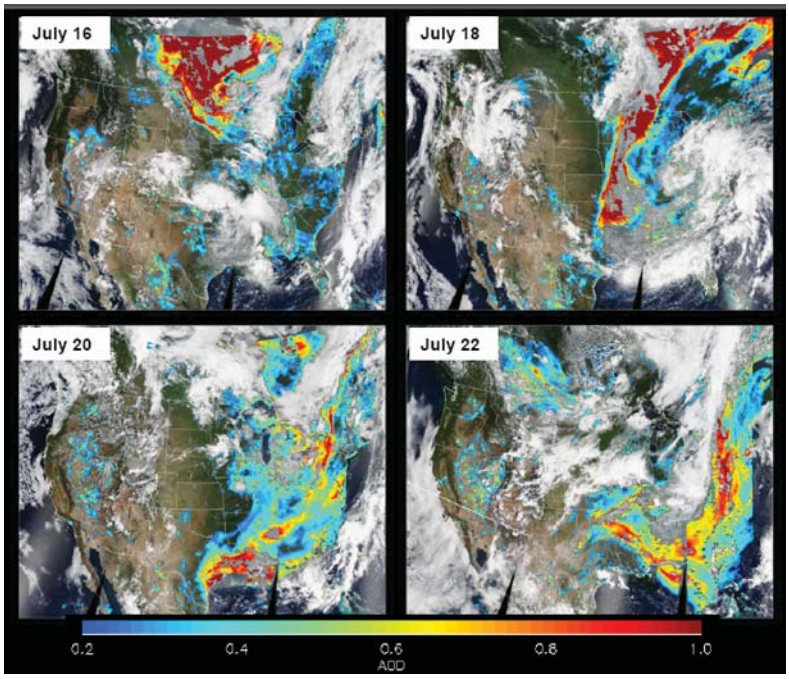
- Reducing transborder air pollution transport, visit http://www.epa.gov/airmarkets/progsregs/usca/index.htm
- Understanding intercontinental transport in the northern hemisphere, visit http://www.htap.org
- Addressing global scale transport, visit http://chm.pops.int and http://www.chem.unep.ch/mercury/new_partnership.htm
- Building cooperative relationships to improve air quality and reduce long-range transport of air pollution in key countries, visit http://www.epa.gov/oia/regions/

Shipping and Aviation Emissions

Shipping and aviation are two of the fastest growing sources of emissions globally, with important consequences for air quality. Emissions from both sectors have received increased attention and the International Maritime Organization recently acted to strengthen emissions controls on ocean-going ships.

EFFORTS TO BETTER UNDERSTAND TRANSPORT OF AIR POLLUTION

EPA and other agencies are working via treaties and international cooperative efforts to address the international transport of air pollution. Since 2001, EPA has led collaborative efforts among many of the leading U.S. researchers in the global atmospheric chemistry community to improve our understanding of trans-Pacific and trans-Atlantic transport. EPA and the European Commission co-chair the Task Force on Hemispheric Transport of Air Pollution, a multinational effort to better understand the soures, transport, and impacts of air pollution in the northern hemisphere. In 2008, EPA, with contributions from NOAA, NASA, and the National Science Foundation (NSF), has sponsored a National Academy of Sciences study to examine the significance of the international transport of air pollutants for air quality, atmospheric deposition, and climate change.



Tracking Air Pollutant Transport with Satellites

During the 2004 summer, the largest Alaskan wild fire event on record occurred in late June-July and consumed 2.72 million hectares of boreal forest. The figure shows aerosol optical depth (AOD) data from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument aboard the Terra satellite for a series of days in July 2004. The MODIS AOD is plotted over the MODIS Terra true color image for each day. This series of days shows high aerosol concentrations (in red) associated with long-range transport of the Alaskan wild fire plume as it crosses over the northern border of the U.S. on July 16. This aerosol plume travelled south-eastward behind the cold front (evident in the clouds captured in the MODIS true color image) over the following days, eventually affecting surface $PM_{2.5}$ levels along the Eastern U.S.

Aerosol optical depth (AOD) measurements for a series of days in July 2004. (Image provided by J. Szykman, EPA, and C. Kittaka, SSAI-NASA/LaRC)